

What is Claimed is:

1 1. A coordinatable system of inclined
2 geosynchronous satellite orbits, comprising:

3 a plurality of satellite positions
4 representing the maximum number of satellites that may
5 be included in the coordinatable system of inclined
6 geosynchronous satellite orbits to achieve optimum
7 satellite coverage during a specified period within a
8 specified service area;

9 each satellite position being located in one
10 of a plurality of satellite orbits forming one of a
11 plurality of families of satellite orbits;

12 each of the plurality of satellite orbits
13 within any one of the plurality of families of
14 satellite orbits defining an orbital plane having a
15 unique inclination with respect to the equatorial
16 plane of the Earth and with respect to the orbital
17 plane of any other one of the plurality of satellite
18 orbits within the same family of satellite orbits;

19 the plurality of satellite orbits within any
20 one of the plurality of families of satellite orbits
21 having identical apogees;

22 loci of subsatellite points repeatedly
23 traced upon the surface of the Earth by a straight
24 line extending from the center of the Earth to an
25 orbiting satellite position generating an imaginary
26 ground track on the surface of the Earth;

27 the ground track traced by orbiting
28 satellite positions within any one of the plurality of
29 families of satellite orbits defining an area
30 therewithin that differs from the area defined within
31 the ground track traced by orbiting satellite

32 positions within any other family of satellite orbits;
33 the ground tracks being mutually and
34 generally symmetrically nested about a first longitude
35 of symmetry to form a first set of ground tracks; and
36 the satellite positions within each of the
37 plurality of families of satellite orbits being
38 coordinated with each other and being further
39 coordinated with the satellite positions to achieve a
40 minimum specified angular separation between
41 satellites occupying the plurality of satellite
42 positions and using the same frequencies.

1 2. The system of claim 1, wherein the
2 eccentricity of each satellite orbit is high enough
3 with respect to the inclination thereof so that a
4 ground track traced by orbiting satellite positions
5 within each family of satellite orbits does not cross
6 itself.

1 3. The system of claim 2, wherein each of
2 the plurality of satellite orbits is configured to
3 position the maximum latitude of the ground track
4 traced by orbiting satellite positions within each
5 family of satellite orbits at a specified longitude.

1 4. The system of claim 3, wherein the
2 satellites in each of the plurality of families of
3 satellite orbits are coordinated so that they are
4 equally spaced in time.

1 5. The system of claim 4 further including
2 a plurality of additional satellite positions to
3 generate at least a second set of ground tracks

disposed at at least a second longitude of symmetry.

6. A method of providing a coordinatable system of inclined geosynchronous satellite orbits, the method comprising:

specifying at least one geographic service within which satellite coverage is to be provided;

specifying a period during which satellite coverage is to be optimized;

defining a plurality of families of satellite orbits, each satellite orbit defining the path of a satellite position, each satellite orbit in each of the plurality of families of satellite orbits defining an orbital plane having a unique inclination with respect to the equatorial plane of the Earth and with respect to the orbital plane of any other one of the plurality of satellite orbits within the same family of satellite orbits, the plurality of satellite orbits within any one of the plurality of families of satellite orbits having identical apogees, loci of subsatellite points repeatedly traced upon the surface of the Earth by a straight line extending from the center of the Earth to an orbiting satellite position generating an imaginary ground track on the surface of the Earth, the ground track traced by orbiting satellite positions within any one of the plurality of families of satellite orbits defining an area therewithin that differs from the area defined within the ground track traced by orbiting satellite positions within any other family of satellite orbits;

configuring each satellite orbit in each of the plurality of families of satellite orbits so that the ground tracks are mutually and generally

32 symmetrically nested about a first longitude of
33 symmetry to form a first set of ground tracks;

34 determining a maximum number of satellites,
35 and thus of satellite orbits, that may be included in
36 each of the plurality of families of satellite orbits
37 and determining the shape and geographic position of
38 each ground track to achieve minimum specified angular
39 separation between satellite positions using the same
40 frequencies and to achieve optimum satellite coverage
41 during the specified period in the at least one
42 service area specified; and

43 coordinating the position of satellites in
44 satellite orbits in accordance with the determined
45 maximum number of satellite positions and the minimum
46 specified angular separation therebetween.

1 7. The method of claim 6, wherein the step
2 of defining a plurality of families of satellite
3 orbits, each orbit defining the path of a satellite
4 position, further includes selecting an eccentricity
5 for each satellite orbit that is high enough with
6 respect to the inclination thereof so that a ground
7 track traced by orbiting satellite positions within
8 each family of satellite orbits does not cross itself.

1 8. The method of claim 7, following the
2 step of determining a maximum number of satellites,
3 further including the step of configuring each of the
4 plurality of satellite orbits to position the maximum
5 latitude of the ground track traced by orbiting
6 satellite positions within each family of satellite
7 orbits at a specified longitude.

1 9. The method of claim 8, wherein the step
2 of coordinating the placement of satellites in
3 satellite orbits further includes phasing the
4 satellites in each of the families of satellite orbits
5 so that they are equally spaced in time.

1 10. The method of claim 9, following the
2 step of configuring each of the plurality of satellite
3 orbits to position the maximum latitude of the ground
4 track traced by orbiting satellite positions within
5 each family of satellite orbits at a specified
6 longitude, further including the step of including
7 additional satellite positions to generate at least a
8 second set of ground tracks disposed at at least a
9 second longitude of symmetry.